

## Tivadar Mach

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### Research Interests

Lipid membrane electrophysiology/bioelectrochemistry: measuring binding events in nano-channels by conductance fluctuation (nano-Coulter counters in biological and artificial channels), membrane protein incorporation, trans-membrane in- and efflux, membrane fusion.  
System development: free standing micro-lipid bilayer for rapid screening, lipid adhesion properties to substrates, microfluidics design.

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### Education

2006 to date	<b>Jacobs University Bremen, Bremen, Germany</b> Ph.D. in Physics, thesis title (pending): "Weak binding in large bacterial pores – measurement and biological relevance"
2004-2006	<b>Jacobs University Bremen, Bremen, Germany</b> M.S. in Nanomolecular Science, thesis title: "Translocation through nanopores via an internal binding site"
2000-2003	<b>University of Cambridge (Trinity College)</b> M.A. Hons. – Natural Sciences Tripos (Physical) Part II: Materials Science Part IB: Advanced Physics and Materials Science Part IA: Mathematics, Physics, Chemistry, Materials and Minerals Sc.
1998-2000	<b>United World College of the Adriatic, Duino Italy</b> International Baccalaureate (I.B.): 45 points (of 45); secondary education
1995-1998	<b>PTE Babits Mihály Secondary School, Hungary</b> Secondary education, grade average: 5.0 (maximum scale: 5)

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### Techniques Experience

Free standing planar lipid bilayer ('BLM' – folded & painted) electrophysiology, micro-BLM (Nanion™ Port-a-Patch based) – single channel and ionophore analysis; Bulk absorbance and fluorescence spectroscopy – dye efflux from liposomes, bulk FRET, etc.; liposome swelling assay; Dynamic Light Scattering, Electrophoretic Light Scattering; Microelectrophoresis; Giant Vesicle preparation and imaging. Scanning Electron Microscopy, Energy dispersive X-ray spectroscopy, X-ray and neutron diffractometry, Four-point conductivity/resistivity, chemical (HF) etching, UHV chemical vapour deposition

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## Work experience

2004 to date	<b>Jacobs University Bremen, Bremen, Germany</b> Teaching assistant in various semesters for: Biophysical Chemistry (practical course and lecture course), Advanced Physics laboratory course, General Physics laboratory course
2005	<b>Jacobs University Bremen, Bremen, Germany</b> Multimedia services assistant – digitization, audiovisual design, etc.
2003-2004	<b>University of Pécs &amp; MA-MO Education Ltd. , Pécs, Hungary</b> Teaching assistant in physics and EFL; course organization (syllabus design, administration related to the introduction of the Bologna process)
2003	<b>University of Cambridge, Materials Science department</b> Research in the Materials Chemistry and Phase Transformation groups – Investigation of 6-4 Titanium alloys obtained by the FFC-Cambridge electrolysis process
2002	<b>Paks Nuclear Power Plant, Paks, Hungary</b> Intern in the Materials Analysis Laboratory – SEM imaging and radiation damage analysis, nuclear tracks, neutron diffractometry, etc.
1994-2001	<b>Pécs, Hungary &amp; Trieste, Italy</b> Occasional employment in various Hungarian NGOs, administration of the University of Pécs, social work with elderly and disabled in Trieste

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## Awards, Scholarships, Competitions

2007	Grant from DAAD-RISE programme
2000-2003	Cambridge Overseas Trust and Newton Trust Scholar (Full undergraduate bursary)
2000	“First step to a Nobel Prize in Physics” international research competition – first prize, invited to research stay at the Polish Academy of Sciences
2000	XXXI International Physics Olympiad, Leicester
2000	Italian National Physics Olympiad, 1 <sup>st</sup> prize
1994-1998	Among the first ten places of 26 different national or regional academic competitions in Hungary, of which 22 Natural Science / Mathematics, 4 Social Sciences. Two governmental awards for extraordinary studentship (Hungarian).

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## Additional Skills

<b>Languages</b>	Hungarian	native	Italian	conversational
	English	fluent	Romanian	basic knowledge
	German	fluent	Russian	basic knowledge

**PC Knowledge** MSOffice, OpenOffice; LaTeX; web layout (html, JavaScript, some experience with php); programming – FORTRAN 95, Pascal, Basic; numerical computation – Matlab, scilab; symbolic computation – wxMaxima, Mathcad; plotting – GNUplot, OriginLab, etc.; single channel analysis software – pClamp, HEKA Patchmaster & Fitmaster, GePulse; CAD – QCad; Neural Network modelling – Neuromat's Model Manager and adapted versions; materials engineering software – Cambridge Materials Selector, etc.; diverse graphics and multimedia software. Familiar with MSWindows, MSDOS, Linux, and Solaris systems.

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### Extracurricular Activities

**Elected positions 2000 to date** Secretary of the Graduate Student Association, Jacobs University Bremen  
International Officer in the Cambridge University Students' Union  
University of Cambridge, student representative on: Department board of Physics (2 consecutive years); Department Board of Materials Science and Metallurgy; Faculty Board of the Faculty of Physics and Chemistry; Natural Science Tripos management committee of the University

**Extracurriculars** Working for Amnesty International (founding member of group Duino-Aurisina in Italy) and various other NGOs (Seeds of Peace, Hungarian Natural Reserves Union, etc.)  
Choir member in Italy and Cambridge, substitute choir master and conductor in Italy, life member of the Trinity College Music Society.  
Qualified lifeguard in Hungary, swimming (not competitively since 1999).  
Designed and maintained several webpages (school and student union).

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### Publications

#### Refereed journals:

T Mach, P Neves, E Spiga, H Weingart, M Winterhalter, P Ruggerone, M Ceccarelli and P Gameiro (2008): *Facilitated permeation of antibiotics across membrane channels – interaction of the quinolone moxifloxacin with the OmpF channel*. In: Journal of the American Chemical Society [**Accepted with minor corrections**]

C Khare, T Mach, H Weingart and M Winterhalter (2008): *Permeation through nanochannels - a novel system for the characterization of biochannels*. In: Journal of Advances in Engineering Science Vol. **2** (1) pp. 13-22.

Tivadar Mach, Catalin Chimerele, Jürgen Fritz, Niels Fertig, Mathias Winterhalter and Claus Fütterer (2008): *Miniaturized planar lipid bilayer: increased stability, low electric noise and fast fluid perfusion*. In: Analytical and Bioanalytical Chemistry Vol. **390** (3) pp. 841-846.

#### Conference proceedings:

Tivadar Mach, Kozhinjampara R. Mahendran, Alberta Paula L.M. Gameiro dos Santos, Matteo Ceccarelli, Mathias Winterhalter: *Weak binding in large channels – measurement and effect on substrate translocation*. "Physics meets Biology 2008" (Inaugural meeting of the Biological Physics Group of the Institute of Physics), 13-16 July 2008, Oxford, United Kingdom

Tivadar Mach, Kozhinjampara R. Mahendran, Andrey N. Bessonov, Enrico Spiga, Isabel Sousa, Helge Weingart, Alberta Paula L.M. Gameiro dos Santos, Matteo Ceccarelli, Mathias Winterhalter: *The effect of antibiotic binding to bacterial membrane proteins on drug accumulation*. "72. Jahrestagung der Deutsche Physikalische Gesellschaft", 25-29 February 2008, Berlin, Germany

Kozhinjampara R. Mahendran, Andrey N. Bessonov, Helge Weingart, Tivadar Mach, Chloe E. James, Jean-Marie Pages, Amit Kumar, Matteo Ceccarelli, Mathias Winterhalter: *Understanding antibiotic translocation through porins from E. coli and E. aerogenes*. Joint meeting of the Biophysical Society 52<sup>nd</sup> Annual Meeting and 16<sup>th</sup> International Biophysics Congress. 5 February 2008, Long Beach, California, USA

Tivadar Mach, Mohamed Kreir, Catalin Chimerele, Jürgen Fritz, Niels Fertig, Mathias Winterhalter, Claus Fütterer: *Horizontal lipid bilayer in a microfluidics system*. "International Summerschool: Biosensing with channels", 25- 31 August 2007, Ile de Berder, Larmor-Baden, France

Tivadar Mach, Kozhinjampara R. Mahendran, Andrey N. Bessonov, Patricia S. Santos das Neves, Isabel Sousa, Alberta Paula L.M. Gameiro dos Santos, Mathias Winterhalter: *Pathway of quinolones through the E. coli outer membrane*. "International Summerschool: Biosensing with channels", 25- 31 August 2007, Ile de Berder, Larmor-Baden, France

Chinmay Chandrashekar Khare, Tivadar Mach, Claus Fütterer, Mohamed Kreir, Niels Fertig, Mathias Winterhalter: *A novel horizontal black lipid bilayer system incorporated in a microfluidics chip*. "EuroNanoforum 2007", 19-21 June 2007, Düsseldorf, Germany

Catalin Chimerele, Tivadar Mach, Helge Weingart, Ulrich Kleinkathöfer, Mathias Winterhalter: *Facilitated permeation through porins*. "Deutsche Physikalische Gesellschaft Jahrestagung 2007", 29 March 2007, Regensburg, Germany

Tivadar Mach, Claus Fuetterer, Jurgen Fritz, Niels Fertig, Catalin Chimerele, Mathias Winterhalter: *Preparation of horizontal black lipid bilayers incorporated in a microfluidics system for microscopy and industrial parallelization*. "Deutsche Physikalische Gesellschaft Jahrestagung 2007", 29 March 2007, Regensburg, Germany

Tivadar Mach: *Translocation of antibiotics through a bacterial pore*. "International Summerschool: Biosensing with channels", 28 July - 4 August 2006, Bremen, Germany

Karin Tuerk, Tivadar Mach, Patricia Neves, Paula Gameiro, Mathias Winterhalter: *Translocation pathway of Fluoroquinolone antibiotics through bacterial porins*. "3rd International Conference on Structure, Dynamics and Function of Proteins in Biological Membranes", May 14 - 19, 2006, Monte Verità, Ascona, Switzerland

Tivadar Mach, Karin Tuerk, Luminita Damian, Sergei M Bezrukov, Mathias Winterhalter: *Antibiotic translocation through OmpF*. "Deutsche Physikalische Gesellschaft Jahrestagung 2006", 29 March 2006, Dresden, Germany